

REMARKS

Claims 1-26 are pending in the present Application. In the January 30, 2004 Office Action, Claims 1-4, 6-7, and 9-11 are rejected under 35 U.S.C. 102(e) and claims 5, 8, 12-26 are rejected under 35 U.S.C. 103(a). In response to the Office Action, Applicant is amending claims 1, 3-10, 15, 17, 19, 22, 24 and 25, canceling claims 2, 23 and 26, and adding new claims 27-29. No new matter has been added.

Rejection under 35 U.S.C. § 102

On page 2 of the Office Action, claims 1-4, 6-7, and 9-11 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,664,959 to Duluk et al. (hereinafter, “Duluk”). In response, Applicant is amending claim 1 to require that the “pipeline structure” recited in claim 1 include “a first plurality of sequential logic circuits coupled in series and a second plurality of parallel logic circuits coupled to the first plurality of sequential logic circuits, each of the logic circuits configured to determine whether a polygonal portion of the raster image is at least partly inside the graphics primitive.” Duluk does not teach a pipeline structure having separate sequential logic circuits and parallel logic circuits such that each of the sequential and parallel logic circuits can determine a polygonal portion that is at least partly inside a graphics primitive. Instead, Duluk discloses a Z Cull unit 9012 (parallel logic circuit) that is composed of multiple state machines 9057 (sequential logic circuits) each of which can process a sample (pixel) in a stamp (tile) in parallel with each other (FIG. 14; Col. 37, lines 19-23). Duluk does not teach the structure or combination of structure as recited in amended claim 1. Accordingly, Applicant asserts that claim 1 is allowable. Because claims 3-4, 6-7, and 9-11 depend either directly or indirectly from claim 1, Applicant asserts that claims 3-4, 6-7, and 9-11 are allowable for at least the same reasons stated above for claim 1.

Rejection under 35 U.S.C. § 103

On page 6 of the Office Action, claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatenable over Duluk, in view of U.S. Patent No. 6,359,623 to Larson (hereinafter, “Larson”).

In response, Applicant has amended claim 5 to recite, “a vector function comprising both an x-component and a y-component of a vector normal to the edge function”. In contrast to amended claim 5, Larson does not teach or suggest “a vector function comprising both an x-component and a y-component of a vector normal to the edge function”. Accordingly, Applicant asserts that claim 5 is allowable.

On page 7 of the Office Action, claim 8 is rejected under 35 U.S.C. § 103(a) as being unpatenable over Duluk.

Claim 1 as amended recites, “a first plurality of sequential logic circuits coupled in series and a second plurality of parallel logic circuits coupled to the first plurality of sequential logic circuits, each of the logic circuits configured to determine whether a polygonal portion of the raster image is at least partly inside the graphics primitive.” As discussed in further detail in the previous section entitled, “Rejection under 35 U.S.C. § 102,” Duluk does not teach a pipeline structure having separate sequential logic circuits and parallel logic circuits such that each of the sequential and parallel logic circuits can determine a polygonal portion that is at least partly inside a graphics primitive. Accordingly, Applicant asserts that amended claim 8 is not prima facie obvious in light of amended claim 1 and is therefore allowable.

On page 8 of the Office Action, claims 12-26 are rejected under 35 U.S.C. § 103(a) as being unpatenable over Larson, in view of U.S. Patent No. 6,480,205 to Greene (hereinafter, “Greene”).

Claims 12 and 20 of the present invention recite, “determining whether a polygonal portion of the raster image is at least partly inside the graphics primitive by using a coordinate reference frame located at a geometric center of the polygonal portion.” On page 8 of the Office Action, the Examiner admits that Larson does not implicitly teach using a coordinate reference frame which must be located at the geometric center of a tile or portion. On page 9 of the Office Action, however, the Examiner asserts that “Greene teaches implicitly a reference frame located at a geometric center of the tile.”

A close reading of Greene shows that Greene does not implicitly teach a reference frame located at a geometric center of a tile or a polygonal portion. Figure 2 of Greene depicts an abstraction of lower level tiles (220) and an upper level tile (210) in a z-pyramid. In this abstraction, the lower level tiles (220) are shown in the same two-dimensional space (212) as the upper level tile (210). Importantly, the coordinate reference frames (224) shown in Figure 2 of Greene are for the lower level tiles (220) not for an upper level tile (210). As disclosed at Col. 14, lines 26-27 of Greene, “[t]he origin of the coordinate frame is located at the tile’s lower-left corner.” Further, as shown in both Figures 2 and 15 of Greene, the coordinate reference frame (222) of the upper level tile (210) is located at the lower-left corner of the tile (210). Because Greene does not implicitly teach a reference frame located at a geometric center of a tile or a polygonal portion, Applicant asserts that claims 12 and 20 are allowable.

Moreover, Greene discloses at Col. 14, lines 26-37 that the coordinate values associated with the tiles are non-negative integers. Accordingly, Greene teaches away from a coordinate reference frame located at a geometric center of a tile in which the coordinate values for vertices of the tile may be positive or negative. In contrast to the coordinate systems disclosed in Greene, the coordinate reference frame of the present invention is located at a geometric center of a tile so that the coordinate values for the vertices of the tile

may be positive or negative. As disclosed in paragraph 54 and in Figure 8 of the Application, this property of the coordinate values for the vertices of a tile being referenced with respect to a coordinate reference frame located at a geometric center of a tile allows the vertex furthest from a primitive edge in a direction toward the inside of a graphics primitive to be determined by evaluating an edge function without having to perform the edge function. Such an edge function can be evaluated by finding a combination of the x-component (n_x) and y-component (n_y) of an edge function and the coordinate values of a vertex (x and y) of a tile such that the product $n_x x$ is a positive value and the product $n_y y$ is a positive value. For these additional reasons, Applicant asserts that claims 12 and 20 are allowable.

For all the above reasons, Applicant asserts that Larson and Greene, individually or in combination, do not teach or suggest “determining whether a polygonal portion of the raster image is at least partly inside the graphics primitive by using a coordinate reference frame located at a geometric center of the polygonal portion”, as recited in claims 12 and 20. Therefore, claims 12 and 20 are allowable. Because claims 13-19 depend either directly or indirectly from claim 12, Applicant asserts that claims 13-19 are allowable for at least the same reasons stated above for claim 12. Because claim 21 and new claim 27 depend directly from claim 20, Applicant asserts that claim 21 and 27 are allowable for at least the same reasons stated above for claim 20.

Claim 22 of the present invention recites, “defining a coordinate reference frame located at a geometric center of the tile”. For at least the same reasons stated above for claims 12 and 20, Applicant asserts that Larson and Greene, individually or in combination, do not teach or suggest “a coordinate reference frame located at a geometric center of the tile”, as recited in claims 22. Accordingly, Applicant asserts that claim 22 is allowable. Because claims 24-25 depend directly from claim 22, Applicant asserts that claims 24-25 are allowable for at least the reasons stated above for claim 22.

New independent claim 28 recites, “deriving edge functions for the graphics primitive according to a coordinate reference frame located at a geometric center of a tile in the raster image”. For at least the same reasons stated above for claims 12 and 20, Applicant asserts that Larson and Greene, individually or in combination, do not teach or suggest “a coordinate reference frame located at a geometric center of a tile”, as recited in claim 28. Accordingly, Applicant asserts that claim 28 is allowable. Because claim 29 depends directly from claim 28, Applicant asserts that claim 29 is allowable for at least the reasons stated above for claim 28.

CONCLUSION

Based on the foregoing remarks, Applicant believes that the rejections in the Office Action of January 30, 2004 are fully overcome, and that the Application is in condition for allowance. If the Examiner has questions regarding the case, the Examiner is invited to contact Applicant's undersigned representative at the number given below.

Respectfully submitted,

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